

# Introduction to the HARMONIE system

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**HIRLAM All Staff Meeting / 17th ALADIN Workshop,  
Oslo 23-26 April, 2007**

# Why do we need a general NWP system and an open repository?

A NWP system can never be simple and there are no “ordinary users”. The drag and drop system is a Fata Morgana at the horizon.

However, we should aim for a system that is dynamic enough to provide:

- An easy start for beginners and a flexible tool for researchers
- Common code/script/tool base
- Changes/updates should be broadcasted quickly.
- EVERYBODY should have easy access to the latest code, scripts and tools

Nice dream, isn't it?

Next some reality ...

# The birth of HARMONIE

**When:** Thu Nov 30 08:16:29 GMT 2006  
(When Xiaohua's mail was posted on the HIRALD list)

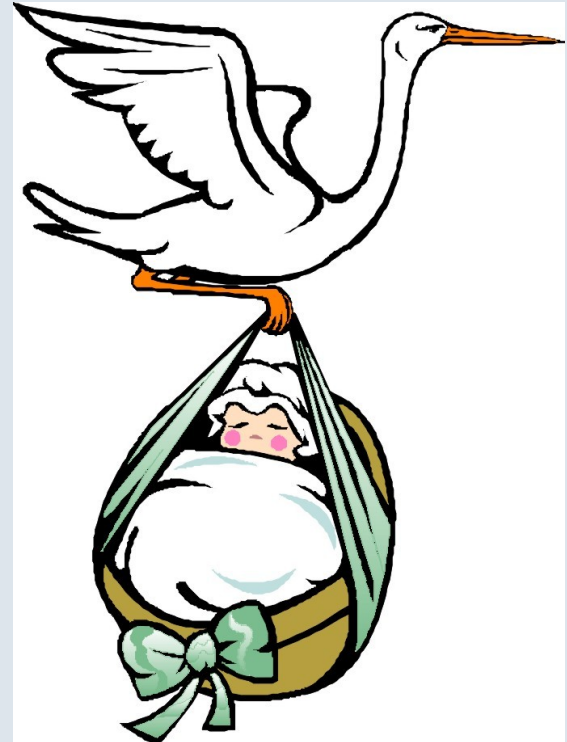
**Where:** HIRLAM-A mesoscale workshop at FMI

**Sex:** Unknown

**Length:** Endless

**Weight:** 92MB, unpacked

**Name:** subversion revision 4788 "Importing initial ALADIN CY31T1 vendor drop."



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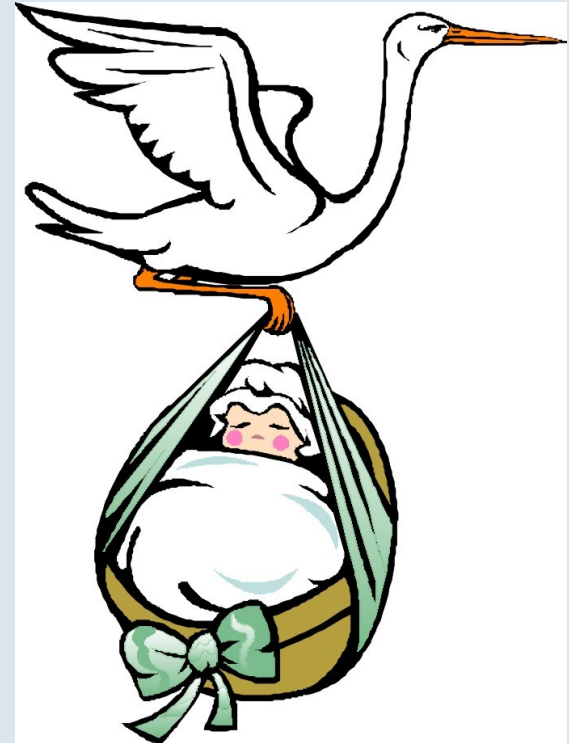
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**For us (HIRLAM) it was felt important to start building HARMONIE similar to HIRLAM, a complete NWP system.**

# The benefits of an open easy to access system.

**I sent out a request for domain definitions of ALADIN/AROME used in HIRLAM**

**On the wiki page the following log appears**

**09:41 Sami Niemela : Southern Finland area added**

**10:21 Ulf Andrae : Swedish domains added**

**10:40 Andrea Storto : Norwegian domains added**

**11:31 : Xiaohua Yang : Added Danish AROME domain**

**Any user could just update their local version with**

**Svn update**



# Repository structure

• <https://hirlam.org/trac/browser/trunk/harmonie>

- **src** ARPEGE/IFS CY31T1 with some modifications to make it run on HPCE/SMHI linux cluster and bug fix for soil ice in AROME.
- **scr** Scripts for running the model
- **nam** Namelists for climate generation, fullpos and ALADIN-(N)H/AROME/ forecasts with ALADIN or HIRLAM physics.
- **util**
  - **gl** Converter, LBC,
  - **monitor** Verification and Monitoring
  - **gmkpack 6.2.** for compilation and version control

Documentation at [https://hirlam.org/trac/wiki/Harmonie\\_31h1](https://hirlam.org/trac/wiki/Harmonie_31h1)

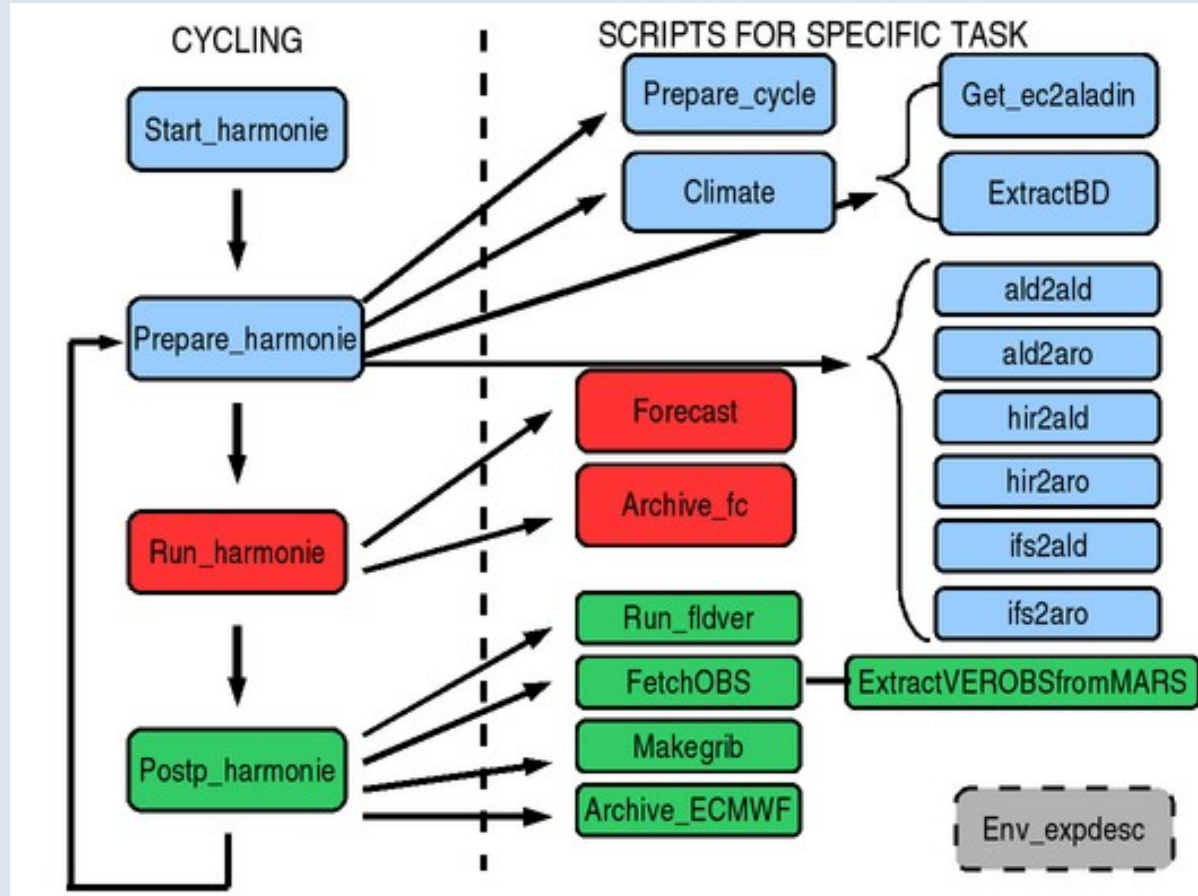
We try to point to GMAPDOC for ALADIN scientific/technical documentation

# HARMONIE in a nutshell

(graph from Sami Niemela)

The script environment should work anywhere but some things are computer dependent such as e.g. queue system. Some things are very ECMWF specific such as access to MARS and ECFS.

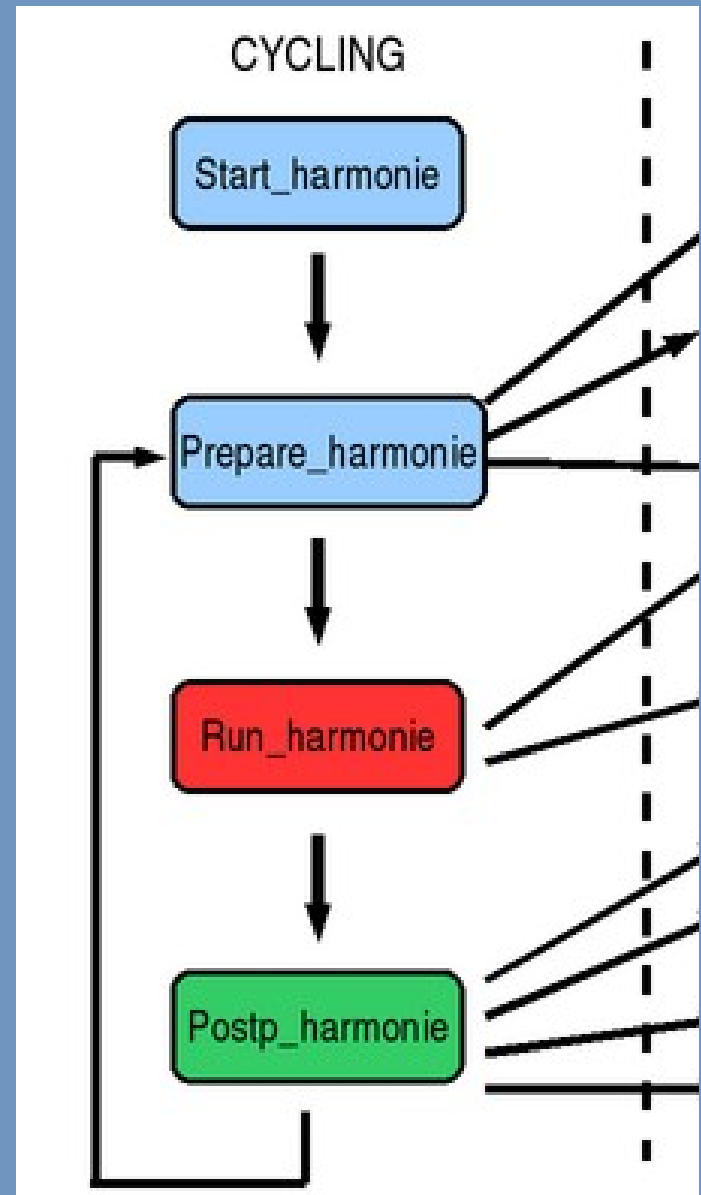
- Prepare the for the forecast
- Run the forecast
- Perform postprocessing



# HARMONIE in a nutshell

## Cycling

- **Start\_harmonie** defines start and end date and submits your job.
- Preparations and postprocessing runs as scalar jobs, the forecast as a parallel job.
- Each job is submitted by the previous job and repeated until the end date is reached; “very poor mans mSMS”.
- Used for experiments at ECMWF and for daily runs at (least) SMHI and FMI.
- At FMI it runs under SMS. SMS then replaces the cycling scripts but the rest is used (almost) as it is.





# Specify your experiment (1/3)

A grey rounded rectangle with a dashed border containing the text "Env\_expdesc".

```
CY=31t1 # Cycle
MYLIB=test_${CY} # Pack name
EXP=${MYLIB} # Experiment name
HOMEPACK=${HOMEPACK}
SCRDIR=${HOMEPACK}/${MYLIB}/scr # Script directory
NAMDIR=${HOMEPACK}/${MYLIB}/nam # Namelist directory
BINDIR=${TEMP}/ALADIN/${MYLIB}/bin # Executable directory
WRK=${TEMP}/ALADIN/${EXP}/wrk/$DTG # Work directory

# **** Paths to archive ****
ARCHIVE=${TEMP}/ALADIN/$EXP/archive/$DTG # Archive
EXTRARCH=${ARCHIVE}/extract # Archive for fld/obs-extractions

# **** Path to boundary files ****
BDLIB=RCRa # Boundary experiment, set:
# ECMWF to use MARS data
# RCRa to use RCRa data from ECFS
# Other ALADIN experiment

BDDIR=${TEMP}/ALADIN/${BDLIB}/archive/$DTG # Boundary file directory
```

## Specify your experiment (2/3)

Env\_expdesc

```

# **** Paths to climate files ****
CLIMDIR=$TEMP/ALADIN/${EXP}/climate           # Climate files directory
BDCLIM=$TEMP/ALADIN/${BDLIB}/climate          # Boundary climate files
                                                # (ald2ald,ald2aro)
                                                # This should point to
                                                # intermediate aladin
                                                # climate file in case of
hir2aro,ifs2aro processes.

CLIMDATA="ec:/rmt/clim_database"              # Location of the climate database

# **** General settings ****
TSTEP=300                                     # Time step
LL=24                                         # Forecast length
BDINT=03                                      # Boundary interval
ARCHINT=01                                   # Archive interval
NPROC=$( ($GMKROOT/util/Psize) )             # Number of processors
MPPEXEC=                                     # Command to run an executable
MODEL=AROMODB                                # Forecast model to execute
                                                # ALADIN,AROME,ALDODB,AROMODB

FLAG="ald_h"                                 # Model/NH flag for finding right namelist etc
# ald_h          Hydrostatic aladin
# ald_nh        NON-Hydrostatic aladin
# arome         Arome

```

# Specify your experiment (3/3)

A grey button with a dashed border containing the text "Env\_expdesc".

```
# **** Nesting settings ****
HOST_MODEL="hir"                # Host model, could be hir,ifs,ald
TRGT_MODEL="ald"                # Target model, could be ald,aro

# **** Model domain ****
DOMAIN=SCANDINAVIA
NLON=256                        # Number of points (x)
NLAT=288                        # Number of points (y)
EZONE=11                        # Number of points over extension zone (x,y)
LONC=14.0                       # Longitude of domain centre (degrees)
LATC=59.2                       # Latitude of domain center (degrees)
LON0=-10.0                      # Reference longitude of the projection
(degrees)
LAT0=59.2                       # Reference latitude of the projection
(degrees)

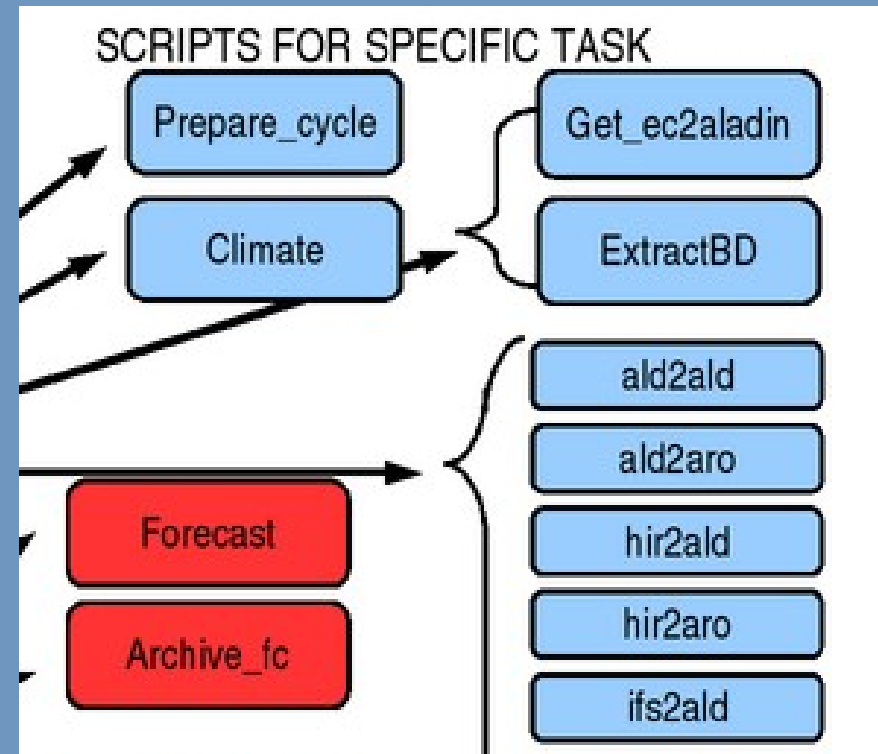
GSIZE=11000.                   # Grid size in meters (x,y)
```

**There are some predefined domains gathered: Scandinavia, Norway, Sweden north/south, Finland south, Denmark**

# HARMONIE in a nutshell

## Preparation

- Setup working and archive directories
- Create climate files for ALADIN, e923. AROME climate generation to be implemented. Needs access to the climate data base.
- Interpolate boundaries
  - ald2ald, ald2aro -> ee927 using fullpos
  - hir2ald/ifs2ald using gl. ifs2ald is not the same as C901
  - hir2aro, ifs2aro using first gl and then fullpos. It's merely a technical implementation and not evaluated yet.
  - Perhaps we should have an arp2ald
- Each interpolation is a single scalar task that can be submitted in parallel.



## HARMONIE in a nutshell

### Forecast

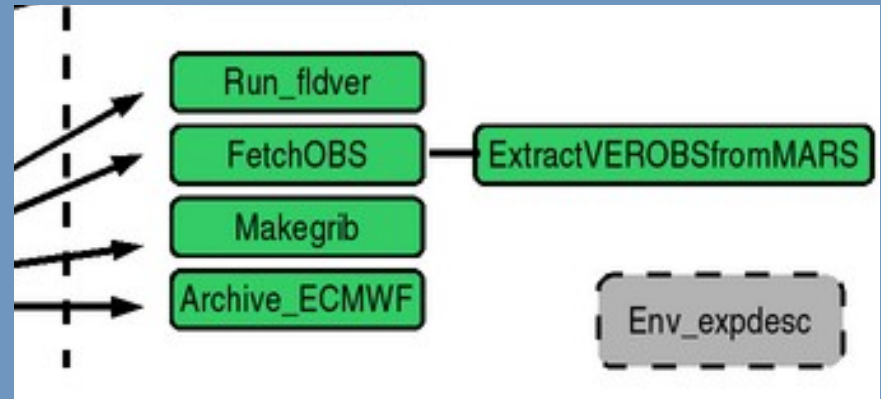
- Run your AROME/ALADIN forecast with the **CORRECT** namelist.
- Copy output files to some archive directory.



## HARMONIE in a nutshell

### Postprocessing

- Extract observation equivalents from model for verification.
- At ECMWF: fetch observations from MARS and extract data for verification.
- Convert selected FA/lfi files/fields to GRIB. Could include interpolation to different grid.
- At ECMWF : Archive FA/lfi files to ECFS.
- Clean the working directories.
- Fullpos postprocessing of e.g. pressure level data, vertical velocity...
- Verification/monitoring include graphics and is not turned on since this is a workstation job.





# The HARMONIE system doesn't yet provide

**A straightforward way to compile the binaries needed for the experiment (ALADIN/AROME/gl/obsextr/fldextr/mandtg)**

- When a HIRLAM experiment is set up it's a full compilation of the system.
- When an ALADIN experiment is set up it compiles the difference relative to a reference installation (ROOTPACK).
- The way subversion is used doesn't at the moment work very well with gmkpack.

**A scheduler (mSMS/SMS)**

- There are some discussion within HIRLAM on how experiments should be prepared and launched in the future (PrepIFS/SMS/mSMS/gmkpack/make)

**An assimilation system**

- One important meteorological part is still missing.

# Things to happen ( very ) soon

- **An official release harmonie\_xxx**
- **SURFEX climate file generation to be included.**
- **Fullpos postprocessing to be added**
- **mSMS?**
- **Import CY32TX, or perhaps mirror the latest clearcase branch? It would be very nice if the systems could be more closely tied together.**

# This is not only for the HIRLAM community

**My wish to the HIRLAM/ALADIN community**

**USE THE SYSTEM!!!!**

- If it is good use it!
  - If it is bad, improve it!
- 
- If you don't have access to the hirlam repository then ask for it! All HIRLAM and ALADIN countries should have access already today.
  - A local installation of subversion (open source) is needed.

# Why do we need a HARMONIE system?

**“Please do not forget that an increased user-friendly environment for developers and end users, is imperative to obtain the spin-off from academia - in particular PhD-students and PostDocs. There are not very many of those working with HIRLAM, and this may seriously hamper necessary innovation and improvements of the code and the science on which the code is based.**

**Instead, Universities are using wrf.**

**Hence, 22-24 people working with HIRLAM, is mainly this small because of too high technical tresholds for users. A better user-friendliness should quickly double-quadruple this number, at least if we enable co-operation with acadiemia on what research issues are important also for improving the system.”**

**In short words: User friendliness and  
functionality is extremely important!**